APPENDIX E

APPENDIX E - ACTIONS

An action is a structure, operating criteria, program, regulation, policy, or restoration activity that is intended to address a problem or resolve a conflict in the Bay-Delta system. An action category is a set of similar actions.

A list of actions was initially compiled from a wide variety of sources, proposals, or actions recommended to solve Bay-Delta system problems. The sources used included all published Bay-Delta Oversight Council (BDOC) documents, environmental documents and study reports addressing Bay-Delta issues, reports by public agencies and interested organizations, and other publications addressing Bay-Delta resources or problems. This list has been continually updated in concert with the development of alternatives to add new actions, remove actions not at the appropriate level of detail (too specific or too general), rename actions to clarify meaning, and combine actions to avoid duplication or overlap.

The action list was organized by grouping individual actions into action categories. This grouping strategy was developed to add structure to a long list of actions. The action categories also evolved over time, resulting in nine major category headings and 49 sub-categories. These major category headings are shown in the adjacent box. While some actions could reasonably be included in more than one category, the actions were placed where they seemed to fit best. This structure does improve the accessibility of the list so individual actions are more easily located.

CATEGORIES OF ACTIONS TO RESOLVE BAY-DELTA PROGRAMS AND MEET PROGRAM OBJECTIVES

- **Restore Bay-Delta System Habitats**
- **Restore Upstream Habitat**
- **Reduce Effects of Diversions**
- **Manage the Enhancement of Anadromous Fish Populations**
- **Reduce Reliance on Delta Exports**
- **Enhance Water Supplies**
- **Increase Supply Predictability**
- **Manage Water Quality**
- **Improve System Reliability**

Note: Forty-nine categories of actions, containing hundreds of individual actions, are included under these major category headings.

A list of the actions is attached following this text. The list identifies the actions grouped by category under each major category heading. For instance, the heading *Restore Upstream Habitat* is followed by four categories of actions: Restoration of Upstream Anadromous Fish Habitat; Physical Improvements for Fish Passage; Restoration of Upstream Riparian habitat; and Restoration of Upstream Wetland Habitat. Each of these categories is followed by one or more actions.

Brief conceptual descriptions of the actions selected for use in the alternatives were prepared as part of the draft alternatives writeups. Appendix N provides an action by action description of

each of the 10 draft alternatives presented at Workshop 6. Given the programmatic nature of the alternatives, the descriptions do not provide the specific sizes or locations that will be available in Phase III of the Program. Rather, the descriptions provide general information on what is envisioned for a range of potential sizes and conceptual locations. For example, the first two actions for Alternative A (in Appendix N) are to ***restore shallow water (tidal) habitat in the Delta*:**

- *Convert 800 to 1,200 acres of existing leveed lands to tidal actions*
- *Include shallow water habitat in reconstruction of 50 to 100 miles of levees*

The actions will become more specific as evaluations continues in Phases II and III of the Program.

The following table shows a listing of actions under each action category.

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RESTORE BAY-DELTA SYSTEM HABITATS	
1.0	Restoration of Bay-Delta Shallow Water (Tidal) Habitat
1.1	-Convert existing leveed lands to tidal action *(10% of lowlands - Sherman Island horseshoe)*
1.2	-Protect and enhance *all* existing shallow habitat from erosion
1.3	-Restore existing diked wetlands to tidal action *in Suisun Bay*
1.4	-Reconstruct levees to include shallow water habitat *(incremental addition to Action 46.1 a,b,c)*
1.5	-Fill deep water to produce shallow habitat *(Frank's Tract/Sherman Island)*
2.0	Restoration of Bay-Delta Riverine Habitat
2.1	-Reconstruct river banks and shallow areas - *no new levees*
2.2	-Protect and enhance existing riverine habitat on channel islands
2.3	-Restore natural channel *cross sections to all non-ship channels*
2.4	-Improve riverine elements at channel edges by modifying levee protection practices *for 50% of levees*
3.0	Restoration of Bay-Delta Riparian Habitat
3.1	-Improve *all* degraded riparian habitats
3.2	-Establish new areas of riparian habitat *(50% of Delta channels)*
3.3	-Reestablish *all* historic riparian areas
3.4	-Improve riparian habitat by modifying levee maintenance practices
3.5	-Protect and enhance *all* existing riparian habitat
3.5a	*-purchase of land*
3.5b	*-annual program*
4.0	Restoration of Bay-Delta Wetland Habitat
4.1	-Protect and enhance *all* existing wetlands
4.1a	*-purchase of land*
4.1b	*-annual program*
4.2	-Expand wetland acquisition programs *to 50% of existing wetlands*
4.3	-Convert *50% of suitable* agricultural lands to wetlands
5.0	Restoration of Bay-Delta Terrestrial Habitat
5.1	-Protect and enhance *all* existing upland habitat
5.1a	*-purchase of land*
5.1b	*-annual program*
5.2	-Establish upland habitat *on levees and fallow cropland*
5.3	-Preserve agricultural land uses providing habitat *in the Delta*
5.4	-Clean-up *known* sites containing toxic substances
5.50	Integrated Habitat Management
5.51	-Establish regional ecosystem restoration program, guidelines *for Delta watershed*
6.0	Establishment of Floodways and Meander Belts
6.1	-Relocate levees *upstream of the Delta* to widen floodways
6.2	-Allow river channels to meander *(where possible) within existing levees upstream of the Delta*
6.3	-Acquire *20% of* Delta island *areas* as overflow areas
6.4	-Restore floodways as habitat corridors *(convert 10% of ag production land in Yolo Bypass)*
7.0	Control of Introduced Species
7.1	-Remove or reduce nuisance species in key habitats
7.2	-Improve regulations regarding ballast-water releases
7.3	-Improve border inspection practices to intercept aquatic pest introductions
7.4	-Inspect for invasions of nuisance species
7.5	-Modify *10% of Delta* habitat to favor native species
8.0	Delta Waterfowl Habitat Management
8.1	-Manage crops *on 5% of Delta ag lands* for waterfowl forage production
8.2	-Improve management of public waterfowl areas
8.3	-Implement terrestrial predator control programs
8.4	-Increase sources and availability of wildlife forage *on 5% of Delta ag lands*

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	RESTORE UPSTREAM HABITAT
9.0	Restoration of Upstream Anadromous Fish Habitat
9.1	'-Improve flows and temperatures in upstream habitats *(AFRP tributary flows)*
9.1a	- *temperature devices at Shasta & investigation at Folsom, Trinity, and New Melones*
9.1b	- *water aquisition*
9.2	-Maintain adequate spawning substrates *(AFRP max recommended)*
9.3	-Restore *San Joaquin R.* channel configurations *for 50% of degraded channel*
9.4	-Restore shoreline habitat conditions *for 50% of degraded shoreline (all upstream areas)*
9.5	-Modify gravel mining practices *to protect spawning and rearing habitat*
9.6	-Improve floodway drainage to reduce fish stranding *(eliminate 90% of stranding)*
10.0	Physical Improvements for Fish Passage
10.1	-Modify fish passage at upstream dams or through other barriers *(all AFRP recommended)*
11.0	Restoration of Upstream Riparian Habitat
11.1	-Encourage improved livestock management in riparian habitats *in all tributary areas*
11.2	-Revegetate *all existing* degraded upstream riparian habitats
11.3	-Protect riparian lands through purchase/easements *(50% of existing riparian lands)*
11.4	-Restore flows to dewatered riparian habitats
12.0	Restoration of Upstream Wetland Habitat
12.1	-Modify floodways to support wetland habitats *(10% of floodway area)*
12.2	-Reuse *10 % of* agricultural drainage to create wetlands
12.3	-Reuse *10% of* urban wastewater effluent to create wetlands
12.4	-Manage groundwater recharge for wetland habitat
	REDUCE EFFECT OF DIVERSIONS
13.0	Delta Inflow Management
13.1	'-Decrease upstream diversions, *in amount (not timing) by 10%*
13.2	-Modify upstream reservoir operations *for fish flows (to modify release and diversion pattern)*
13.3	-Modify Delta inflow timing pattern *for fish flows (reservoir reop + diver'n control)*
13.3R	-Modify Delta inflow timing pattern *to match changes in Delta export cpcty and reduce summer dmds*
13.4	-Provide instream pulse flows for fish passage *(AFRP recommended)*
13.5	-Provide instream flows for fish attraction *(AFRP recommended)*
14.0	Delta Outflow/Export Management for Environmental Quality
14.1	-Modify Central Delta channel operations
14.2	-Modify exprt operations criteria & *reduce exprt of inflow by 10% to reduce entrainment impacts*
14.2R	-Modify export operations criteria *by 2 MAF*
14.2F	-Modify export operations criteria *(maximum extent possible)*
14.3	-Use real-time monitoring and adaptive management
14.3a	*-Install new monitoring system*
14.3b	*-Improve and upgrade existing monitoring system*
14.4	-Increase Delta outflow requirements *(can be negative)*
15.0	Modification of Diversion Timing Patterns
15.1	-Modify diversion timing *(shift)* of in-Delta diversions for ag *to reduce intrainment impacts (by 20%)*
15.2	-Modify diversion timing through Montezuma SCG *(by 50%)*
16.0	Increased Rates of Diversion Capacity
	-Obtain approvals for expanded export capacities *(action redefined to clarify 12/6/95)*
16.1	-To generate additional yield
16.2	-To reduce diversion impacts
	-Enlarge export pumping capacities *(action redefined to clarify 12/6/95)*
16.3	-To generate additional yield *(to maximum proposed design capacity)*
16.4	-To reduce diversion impacts *(to maximum proposed design capacity)*

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16.5	-Increase diversion capability at Red Bluff diversion Dam *to eliminate operation of the dam*
17.0	Acquire Water Supplies for Fish and Wildlife
17.1	-Acquire water for refuge habitat use *(CVPIA level four at all refuges)*
17.2	-Obtain shifts *in 20% of u/s* diversion timing patterns
17.2W	-Obtain shifts *in 20% of u/s* diversion timing patterns *(purchase 100 TAF from San Joaquin R. users)*
18.0	Installation and Improvement of Fish Screens
18.1	-Improve screens at *all* Delta export pumps *(best available technology)*
18.2	-Improve other existing fish screen systems
18.3	-Install screens on *all priority* unscreened in-Delta diversions
18.4	-Install or upgrade screens on all priority upstream diversions
18.5	-Consolidate and screen *50% of* existing small diversions
19.0	Installation of Barriers to Guide Fish Movement
19.1	-Install barriers*/bypass* to block fish movement into Old River
19.2	-Install barriers to keep fish in Sacramento River *(w/o blocking flows)*
19.3	-Install barriers to divert fish from Sacramento to western channels *(w/o blocking flows)*
19.4	-Operate *permanent* fish barrier on San Joaquin R. at Merced R. in fall
20.0	Improvement of Fish Salvage Operations
20.1	-Improve design of salvage facilities *using best available technology*
20.2	-Improve fish salvage procedures *using best available technology*
20.3	-Relocate Clifton Court Forebay Intake
20.4X	*-Add Italian Slough intake to reduce other intake flows into Clifton Court For'b'y*
21.0	Removal and Control of Aquatic Predators
21.1	-Harvest predators at Delta export pumps
21.2	-Harvest predators in upstream habitats
	MANAGE THE ENHANCEMENT OF ANADROMOUS FISH POPULATION
22.0	Fish Hatchery Operations
22.1	-Expand hatchery capacities *to double production of all species*
22.2	-Construct new hatcheries on *the tributaries of* the San Joaquin R.
22.2R	-Construct new hatcheries on the San Joaquin R. *for fall run salmon*
22.3	-Improve hatchery operations *using best available technology*
22.4	-Modify hatchery operations to reduce effects on wild fish populations *using best avail. technology*
22.5	-Mark all hatchery fish
22.6	-Establish new captive breeding programs
22.7	-Pen rearing of striped bass
23.0	Fish Harvest Management
23.1	-Improve regulation of commercial harvest *to protect stocks (no commercial harvest of natural populations)*
23.2	-Improve regulation of recreational harvest *(no harvest of natural populations)*
23.3	-Improve enforcement of harvest regulations *to the maximum feasible*
	REDUCE RELIANCE ON DELTA EXPORTS
24.0	Desalination
24.1	-Expand desalination of Southern California supplies
24.2	-Expand desalination of San Joaquin Valley supplies
25.0	Water Conservation
25.1	-Establish incentives for use of agricultural water conservation practices *(5% reduction in demand)*
25.2	-Increase incentives for use of M&I water conservation practices *(5% reduction in demand)*
25.3	-Educate users about conservation technologies
26.0	Water Reclamation
26.1	-Recharge groundwater with reclaimed water *(to boost recharge by 10% where needed)*
26.2	-Use reclaimed urban wastewater for agricultural irrigation *(10% of wastewater supply)*

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26.3	-Reclaim saline agricultural drainage water *(50% of agricultural drainage)*
26.4	-Recycle and treat urban wastewater for potable reuse *(10% of demand)*
26.5	-Use for non-potable municiple and industrial uses *(50% of demand)*
26.6	-Use reclaimed water to repel salinity intrusion *in the Delta (10% of demand)*
26.7	-Convert industrial water use in Delta to cooling towers *to reduce diversions (e.g. PG&E power plant)*
27.0	Land Retirement and Fallowing
27.1	-Encourage land fallowing during drought periods
27.2	-Develop incentive programs *(e.g., tax breaks)* for land retirement
27.3	-Purchase lands or easements to reduce demand *(retire 10% of ag land)*
28.0	Water Pricing
28.1	-Establish incentives for pricing to reduce demand *by 10%*
	ENHANCE WATER SUPPLIES
29.0	Watershed Management
29.1	-Manage vegetation cover to increase yield *by 5%*
29.2	-Manage riparian zones to protect water quality *(reduce NPS pollutants by 20%)*
29.3	-Manage land uses to protect water quality *(reduce NPS pollutants by 20%)*
29.4	-Modify weather to increase precipitation *and increase yield by 5%*
30.0	New or Expanded On-Stream Storage for Water Supply
30.1	-Construct new on-stream storage south of Delta to reduce storage constraints on exports
30.2	-Construct new on-stream storage north of Delta *to satisfy instream flow goals and demands*
30.2a	*-managed for ecosystem*
30.2b	*-managed for water supply*
30.3	-Enlarge existing on-stream storage reservoirs *to satisfy instream flow goals and demands*
30.3a	-managed for ecosystem
30.3b	-managed for water supply
31.0	New or Expanded Off-Stream Storage for Water Supply
31.1	-Construct new off-stream storage for export areas *to reduce storage constraints on exports*
31.1a	*-managed for ecosystem*
31.1b	*-managed for supply*
31.2	-Construct new off-stream storage upstream of Delta *to satisfy instream flow goals and demands*
31.2a	*-managed for ecosystem*
31.2b	*-managed for supply*
31.3	-Construct new off-stream storage facilities in Delta *to the maximum extent feasible*
31.3a	*-managed for ecosystem*
31.3b	*-managed for supply*
31.4	-Enlarge existing off-stream storage reservoirs *to satisfy instream flow goals and demands*
31.4a	*-managed for ecosystem*
31.4b	*-managed for supply*
32.0	Groundwater Banking and Conjunctive Use
32.1	-Establish incentives for *long-term* conjunctive use *in all basins where feasible*
32.2	-Store groundwater south of Delta *in all basins where feasible and capacity exists*
32.2a	*-manage for eco*
32.2b	*-manage for supply*
32.3	-Store groundwater north of Delta *in all basins where feasible and capacity exists*
32.3a	*-manage for eco*
32.3b	*-manage for supply*
32.5	-Ease institutional barriers to encourage conjunctive use
34.0	Improvement of Through-Delta Conveyance
34.1	-Increase capacities of existing east-side channels
34.2	-Increase flows from the Sacramento R. to the Central Delta *to accomodate all needed exports*
34.3	-Modify Delta levees to increase flow cross-sections *in all major channels*

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34.4	-Construct pumps/siphons between Delta channels *(and across islands)* to accomodate all needed exports
34.5	-Construct expanded export intake/forebay pumping system *to maximum proposed design*
34.6C	*-Close Delta Cross Channel (assumes permanent closure)*
35.0	Construction & Improvement of Conveyance Facilities
35.1	-Construct eastside Delta isolated transfer system *around Delta only (15-20,000 cfs at intake)*
35.2	-Construct westside Delta isolated transfer system *around Delta only (10-15,000 cfs at intake)*
35.3	-Construct small Delta isolated transfer facility *around Delta primarily for drinking water (5-7,000 cfs at intake)*
35.4	-Construct isolated Sacramento Valley Conveyance - eastside *(7,000 cfs)(coupled to 35.6)*
35.5	-Construct isolated Sacramento Valley Conveyance - *large* westside *conveyance (maximum design capacities)*
35.6	-Construct isolated San Joaquin Valley Conveyance - eastside *(5-7,000 cfs)(coupled to 35.4)*
35.7	-Isolated San Joaquin Valley Conveyance - westside (maximum design capacities)
35.8	-Convert Delta islands to storage/conveyance system *(probably no more than 50% of Delta islands)*
36.0	Changes in Location of Diversions
36.1	-Relocate *both* Delta export pumps from key habitats *to best available site*
36.2	-Relocate other in-Delta diversions *so there is no in-Delta diversions*
36.3	-Consolidate in-Delta agricultural diversions *to only one in-Delta diversion*
36.4	-Relocate upstream diversions from key habitats
36.5	-Improve diversion designs when relocating *using best available technology*
36.6	-Multiple 5,000 cfs intakes so can shift location to avoid fish

INCREASE WATER SUPPLY PREDICTABILITY

37.0	Water Transfers
37.1	-Coordinate diversion and conveyance of transfers *(to make up supply shortfalls)*
37.2	-Establish a water transfer brokering mechanism or institution *(could be state or other entity)*
37.3	-Ease institutional obstacles to facilitate water transfers
37.4	-Improve procedures for water transfers permitting
38.0	Long-Term Planning for Drought Contingencies
38.1	-Increase water storage capacities at user locations *to meet drought needs*
38.2	-Establish incentives for Integrated Resources Planning *(incl. drought contingency planning)*
38.3	-Develop alternate supplies for drought situations
39.0	Institutions for Integrated, Long-term Water Management
39.01	-Establish long-term guarantees for management
39.02	-Establish institution to implement guarantees
39.03	-Coordinate multiagency roles in management
39.04	-Coordinate groundwater/surface water management
39.05	-Establish incentives for cooperation/coordination
39.07	-Establish a Delta watermaster to manage flows *(benefits in adaptive management)*
39.08	-Modify water law to establish instream rights
39.09	-Remove legal obstacles to pricing incentive programs
39.12	-Modify California Water Code to encourage conjunctive use
39.14	-Modify California Water Code to ease transfers
39.16	-Allow urban districts to fund mine cleanup in lieu of urban cleanup
39.17	-Establish procedures for allocation of export capacity
39.19	Manage water resources data and information for the Bay-Delta system *(full disclosure of avail. info)*
40.0	Integration of Land Use and Water Supply Planning
40.1	-Coordinate land uses with water supplies

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MANAGE WATER QUALITY

41.0	**Installation and Operation of Flow Barriers**
41.1	-Install flow barriers to manage South Delta quality *(all proposed non-redundant barriers)*
41.2	-Install weirs to control salinity intrusion *(all proposed non-redundant weirs)*
42.0	**Management of Agricultural Drainage**
42.01	-Implement source control regulations for *all* pollutants *causing problems in Delta*
42.02	-Implement pollutant-load limits in San Joaquin R.*for all problem pollutants*
42.05	-Export *50% of* agricultural drainage to other watersheds
42.06	-Retire lands with drainage disposal problems *(10% of all ag lands)*
42.09	-Manage drainage timing to reduce instream impacts *(allow no discharge during low flow periods)*
42.10	-Treat drainage to remove pollutants *(25% of ag drainage)*
42.11	-Dilute pollutants in Delta inflows from SJR using stored water *(2X the water qulty alloc. for New Melones)*
43.0	**Management of Urban and Wastewater Discharge**
43.1	-Improve management of urban stormwater runoff *to retain 25% of runoff*
43.2	-Treat *10% of runoff* discharges to remove problem constituents
43.3	-Construct wetlands to treat wastewater effluent *(use 10% of upstream effluent)*
43.4	-Increase key nutrient inputs to *reduce nutrient limitation in* the estuary
43.5	-Reduce toxic discharges from industrial plants
44.0	**Dredged Material Management**
44.4	-Remove contaminated sediments in *all* critical habitat sites
44.5C	-Investigate techniques for beneficial reuse of dredged materials
44.6S	-Manage dredging to avoid impacts on aquatic habitats
45.0	**Management of Mine Drainage**
45.1	-Improve management of discharges from abandoned mines *(treatment to remove toxics)*

IMPROVE SYSTEM RELIABILITY

46.0	**Levee Maintenance and Stabilization**
46.1	-Monitor, evaluate, maintain, and stabilize *all* existing levees *protecting habitat or economic use*
46.1a	*-reconstruct to HMP level*
46.1b	*-reconstruct to PL99 standards*
46.1c	*-reconstruct as setback with habitat*
46.2	-Modify in-Delta agricultural practices to reduce subsidence *(land side buffer zones and subsidence mgmt.)*
46.3	-Use infilling to correct past in-Delta subsidence *(buttress all levees below mean high tide)*
46.4	-Implement uniform levee maintenance standards
46.5	-Establish *and fund* an emergency levee management plan
47.0	**Improvement of Flooding & Seismic Protections**
47.1	-Reconstruct levees to higher design standards
47.2	-Reconstruct levees to higher seismic standards
47.3	-Relocate levees to more stable sites
48.0	**Rerouting and Protection of Infrastructure**
48.1	-Maintain/reconstruct *all vulnerable* levees around infrastructure *in the Delta*
48.2	-Reconstruct *all vulnerable* infrastructure *in the Delta* to increase reliability
48.3	-Relocate/reroute *all vulnerable* infrastructure *in the Delta*
49.0	**Establishment of Long-Term Funding Mechanisms**
49.1	-Establish a disaster contingency funding program
49.2	-Establish a Bay-Delta financing authority
49.3	-Provide low-cost debt financing for local agencies
49.4	-Establish a bond financing mechanism
49.5	-Establish a statewide water utility surcharge
49.6	-Provide funding for maintenance and stabilization